

I Claim:

- 1 1. A system for ascertaining angle of arrival of an electromagnetic signal; said
2 electromagnetic signal having at least one signal characteristic; said at least one signal
3 characteristic indicating a first state or a second state; the system comprising:
4 (a) a plurality of n antenna elements intersecting a common axis and cooperating
5 to establish $2n$ sectors; each respective sector of said $2n$ sectors being defined by
6 two said antenna elements of said plurality of n antenna elements and said axis;
7 said signal characteristic indicating said first state on a first side of each respective
8 antenna element of said n antenna elements and indicating said second state on a
9 second side of each said respective antenna element; combinations of said signal
10 characteristics in each said respective sector uniquely identifying said respective
11 sector; and
12 (b) an evaluation apparatus coupled with at least two antenna elements of said
13 plurality of n antenna elements; said evaluation apparatus employing said state of
14 said signal characteristic sensed by each of said at least two antenna elements to
15 effect said ascertaining angle of arrival to a resolution of at least one said
16 respective sector.
- 1 2. A system for ascertaining angle of arrival of an electromagnetic signal as recited in
2 Claim 1 wherein said each antenna element of said plurality of n antenna elements is
3 substantially planar.
- 1 3. A system for ascertaining angle of arrival of an electromagnetic signal as recited in
2 Claim 1 wherein said at least one signal characteristic indicates said first state and
3 said second state in a time domain.
- 1 4. A system for ascertaining angle of arrival of an electromagnetic signal as recited in
2 Claim 2 wherein said at least one signal characteristic indicates said first state and
3 said second state in a time domain.

1 5. A system for ascertaining angle of arrival of an electromagnetic signal as recited in
2 Claim 1 wherein said evaluation apparatus comprises a respective receiver unit for
3 each respective said antenna element and at least one processing unit; said at least one
4 processor unit being coupled with each said respective receiver unit; each said
5 receiver unit providing signal amplitude information and information relating to said
6 at least one signal characteristic state for a respective antenna element to said at least
7 one processing unit; said at least one processing unit employing predetermined
8 relationships and said information relating to said at least one signal characteristic
9 state for each at least two said respective antenna elements for effecting said
10 ascertaining angle of arrival.

1 6. A system for ascertaining angle of arrival of an electromagnetic signal as recited in
2 Claim 2 wherein said evaluation apparatus comprises a respective receiver unit for
3 each respective said antenna element and at least one processing unit; said at least one
4 processor unit being coupled with each said respective receiver unit; each said
5 receiver unit providing signal amplitude information and information relating to said
6 at least one signal characteristic state for a respective antenna element to said at least
7 one processing unit; said at least one processing unit employing predetermined
8 relationships and said information relating to said at least one signal characteristic
9 state for each at least two said respective antenna elements for effecting said
10 ascertaining angle of arrival.

1 7. A system for ascertaining angle of arrival of an electromagnetic signal as recited in
2 Claim 1 wherein said evaluation apparatus comprises a respective receiver unit for
3 each respective said antenna element and at least one processing unit; said at least one
4 processor unit being coupled with each said respective receiver unit; each said
5 receiver unit providing signal amplitude information and information relating to said
6 at least one signal characteristic state for a respective antenna element to said at least
7 one processing unit; said processing unit employing first predetermined relationships
8 and said information relating to said at least one signal characteristic state for

9 assigning weighting to information received from each said antenna element for
10 effecting said ascertaining angle of arrival; said processing unit further employing
11 second predetermined relationships and said at least one signal characteristic state for
12 adjusting said weighting assigning to orient a virtual antenna pattern for said plurality
13 of n antenna elements.

1 8. A system for ascertaining angle of arrival of an electromagnetic signal as recited in
2 Claim 2 wherein said evaluation apparatus comprises a respective receiver unit for
3 each respective said antenna element and at least one processing unit; said at least one
4 processor unit being coupled with each said respective receiver unit; each said
5 receiver unit providing signal amplitude information and information relating to said
6 at least one signal characteristic state for a respective antenna element to said at least
7 one processing unit; said processing unit employing first predetermined relationships
8 and said information relating to said at least one signal characteristic state for
9 assigning weighting to information received from each said antenna element for
10 effecting said ascertaining angle of arrival; said processing unit further employing
11 second predetermined relationships and said at least one signal characteristic state for
12 adjusting said weighting assigning to orient a virtual antenna pattern for said plurality
13 of n antenna elements.

1 9. A system for ascertaining angle of arrival of an electromagnetic signal as recited in
2 Claim 1 wherein said evaluation apparatus comprises a signal delay unit, a signal
3 combining unit, a single receiver unit and a processing unit; said signal delay unit and
4 said signal combining unit being coupled with said plurality of n antenna elements;
5 said signal delay unit imposing at least one predetermined delay to selected signals
6 received by said plurality of n antenna elements; said signal combining unit receiving
7 signals from said plurality of n antenna elements and receiving delayed signals from
8 said signal delay unit; said signal combining unit combining said received signals and
9 said delayed signals into a signal stream; said receiver unit receiving said signal
10 stream and providing said signal stream to said at least one processing unit; said at

11 least one processing unit employing predetermined relationships and said information
12 relating to said at least one signal characteristic state of said received signal and said
13 delayed signals for effecting said ascertaining angle of arrival.

1 10. A system for ascertaining angle of arrival of an electromagnetic signal as recited in
2 Claim 4 wherein n is four.

1 11. A system for ascertaining angle of arrival of an electromagnetic signal as recited in
2 Claim 4 wherein n is two.

1 12. A system for ascertaining angle of arrival of an electromagnetic signal; said
2 electromagnetic signal having a signal characteristic indicating a first state or a second
3 state; the system comprising:

4 (a) a plurality of antenna elements intersecting a common axis and cooperating to
5 establish a plurality of sectors; each respective sector of said plurality of sectors
6 being defined by two respective adjacent antenna elements of said plurality of
7 antenna elements and said axis; said signal characteristic indicating said first state
8 on a first side of each respective antenna element of said plurality of antenna
9 elements and indicating said second state on a second side of each said respective
10 antenna element; combinations of said signal characteristics in each said
11 respective sector uniquely identifying said respective sector; and

12 (b) an evaluation apparatus coupled with said plurality of antenna elements; said
13 evaluation apparatus employing said state of said signal characteristic sensed by
14 each of said respective antenna elements to effect said ascertaining angle of arrival
15 to a resolution of at least one said respective sector.

1 13. A system for ascertaining angle of arrival of an electromagnetic signal as recited in
2 Claim 12 wherein said each said respective antenna element is substantially planar.

1 14. A system for ascertaining angle of arrival of an electromagnetic signal as recited in
2 Claim 12 wherein said signal characteristic indicates said first state and said second
3 state in a time domain.

1 15. A system for ascertaining angle of arrival of an electromagnetic signal as recited in
2 Claim 13 wherein said signal characteristic indicates said first state and said second
3 state in a time domain.

1 16. A system for ascertaining angle of arrival of an electromagnetic signal as recited in
2 Claim 12 wherein said evaluation apparatus comprises a respective receiver unit for
3 each respective said antenna element and at least one processing unit; said at least one
4 processor unit being coupled with each said respective receiver unit; each said
5 receiver unit providing signal amplitude information and information relating to said
6 at least one signal characteristic state for a respective antenna element to said at least
7 one processing unit; said at least one processing unit employing predetermined
8 relationships and said information relating to said at least one signal characteristic
9 state for each at least two said respective antenna elements for effecting said
10 ascertaining angle of arrival.

1 17. A system for ascertaining angle of arrival of an electromagnetic signal as recited in
2 Claim 13 wherein said evaluation apparatus comprises a respective receiver unit for
3 each respective said antenna element and at least one processing unit; said at least one
4 processor unit being coupled with each said respective receiver unit; each said
5 receiver unit providing signal amplitude information and information relating to said
6 at least one signal characteristic state for a respective antenna element to said at least
7 one processing unit; said at least one processing unit employing predetermined
8 relationships and said information relating to said at least one signal characteristic
9 state for each at least two said respective antenna elements for effecting said
10 ascertaining angle of arrival.

1 18. A system for ascertaining angle of arrival of an electromagnetic signal as recited in
2 Claim 12 wherein said evaluation apparatus comprises a respective receiver unit for
3 each respective said antenna element and at least one processing unit; said at least one
4 processor unit being coupled with each said respective receiver unit; each said
5 receiver unit providing signal amplitude information and information relating to said
6 signal characteristic state for a respective antenna element to said at least one
7 processing unit; said processing unit employing first predetermined relationships and
8 said information relating to said signal characteristic state for assigning weighting to
9 information received from each said antenna element for effecting said ascertaining
10 angle of arrival; said processing unit further employing second predetermined
11 relationships and said at least one signal characteristic state for adjusting said
12 weighting assigning to orient a virtual antenna pattern for said plurality of n antenna
13 elements.

1 19. A system for ascertaining angle of arrival of an electromagnetic signal as recited in
2 Claim 13 wherein said evaluation apparatus comprises a respective receiver unit for
3 each respective said antenna element and at least one processing unit; said at least one
4 processor unit being coupled with each said respective receiver unit; each said
5 receiver unit providing signal amplitude information and information relating to said
6 signal characteristic state for a respective antenna element to said at least one
7 processing unit; said processing unit employing first predetermined relationships and
8 said information relating to said signal characteristic state for assigning weighting to
9 information received from each said antenna element for effecting said ascertaining
10 angle of arrival; said processing unit further employing second predetermined
11 relationships and said at least one signal characteristic state for adjusting said
12 weighting assigning to orient a virtual antenna pattern for said plurality of n antenna
13 elements.

1 20. A method for ascertaining angle of arrival of an electromagnetic signal at an antenna
2 structure; the method comprising the steps of:

3 (a) in no particular order:

4 (1) configuring said antenna structure to include a plurality of n antenna
5 elements intersecting a common axis and cooperating to establish $2n$
6 sectors; each respective sector of said $2n$ sectors being defined by two said
7 antenna elements of said plurality of n antenna elements and said axis; and
8 (2) providing said electromagnetic signal with at least one signal
9 characteristic; said at least one signal characteristic indicating a first state
10 on a first side of each respective antenna element of said n antenna
11 elements and indicating said second state on a second side of each said
12 respective antenna element of said plurality of n antenna elements;
13 combinations of said signal characteristics in each said respective sector
14 uniquely identifying said respective sector; and

15 (b) evaluating said state of said signal characteristic sensed by each said respective
16 antenna element to effect said ascertaining angle of arrival to a resolution of at
17 least one said respective sector.